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Lumber Recovery From Ponderosa Pine in Western Montana

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Abstract

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Lumber grade yields and recovery ratios are shown for a sample of ponderosa pine (Pinus ponderosa Dougl. ex Laws.) in western Montana. About 9 percent of the lumber produced was in Select grades, 48 percent in Shop grades, and 43 percent in Common grades. Information on log scale and yield is presented in tables by log grade and diameter class.

KEYWORDS: Lumber recovery, lumber yield, ponderosa pine, Pinus ponderosa, Montana.

Summary

Ponderosa pine (Pinus ponderosa Dougl. ex Laws.) is a desirable species for boards and millwork; some products made from ponderosa pine cost over $1,200 per thousand board feet. Yields of Moulding and Shop grades of lumber have been reduced because the production of dimension lumber items has increased because of changes in the size of trees and the demand for these items.

This report presents yield data for a sample of 262 ponderosa pine trees taken from six areas on the Lolo National Forest in western Montana. It provides current information on lumber recovery which can be used by timber and land managers and by the forest products industry.

For the 236 live trees in the sample, 1,033 logs were sawn, yielding 165,226 board feet of surfaced-dry lumber. About 9 percent of this lumber was in Select grades, 48 percent in Shop grades, and the remaining 43 percent in Common grades. Tables and figures show log scale and yield information by log grade and diameter class, based on board-foot and cubic-foot volumes.

Contents

Introduction

Ponderosa pine (<u>Pinus ponderosa</u> Dougl. ex Laws.) is a major softwood species in the Western United States. A USDA Forest Service (1980) report states that the 1977 inventory volume in the northern Rocky Mountain Region alone is an estimated 35 billion board feet (International 1/4-inch rule). Of the 4.4 billion board feet harvested in the Western United States in 1979, 703 million was from the Rocky Mountain Region. Most of this volume is on lands administered by the National Forest System.

Ponderosa pine is a desirable species for boards and millwork; some products reach market prices of more than $1,200 per thousand board feet. Production of dimension lumber items instead of more traditional 1-inch boards has caused reductions in yields of Moulding and Shop grades of lumber. These changes in product mix are associated with changes in the size and quality of timber available for harvest and with the industry processing technology. The occurrence of these changes has created a demand by land managers for information necessary to make reliable predictions of timber value.

The research reported here is the result of a study conducted on lumber recovery from ponderosa pine in western Montana in July 1976. The major objective of the study was to obtain information on lumber volume and grade yields by log size for the current log grading system (Gaines 1962).

The research provides the manager of both public and private timberland with a basis for estimating lumber volume and grade recovery from logs of similar size and grade. The information can be used for making log allocations and for improving mill design and processing.

Study Procedures
Timber Sample

The Lolo National Forest was selected as the sampling area because it contained stands with trees representing the full range of ponderosa pine sawtimber found in the Northern Region (Region 1). Regional Office personnel, industry representatives, and I selected the specific sample areas and study trees.

Six areas that contained a full range of log grades and sizes of sawtimber were selected. The range of tree diameters was divided into 5-inch classes, and trees were selected to obtain about the same number of trees in each class. Trees with grade 1 or 2 logs were specifically selected whenever possible because of the scarcity of these log grades. A total of 262 trees were selected in the six areas, including 26 older dead trees that yielded 95 logs. Each tree was numbered, and the logs sawn from the tree were identified by that number.

Table 1 shows some characteristics of the sample trees.

Table 1--Characteristics of trees by sample area

Sample area	Number of trees	D.b.h. Range	D.b.h. Average	Height Range	Height Average	Defect Range	Defect Average	Age Range	Age Average
		- - -Inches- - -		- - -Feet- - -		- -Percent- -		- - -Years- - -	
1	34	8.9-36.5	25.9	44-136	102	0-38	11	265-413	343
2	34	7.9-37.2	17.9	65-165	108	0-36	7	90-312	181
3	44	12.0-36.7	25.0	52-153	111	0-86	9	110-370	220
4	44	7.4-37.2	20.5	54-139	97	0-17	5	85-345	192
5	47	7.8-16.5	12.0	54-104	76	0-11	3	56-115	75
6	33	8.5-33.8	20.2	30-130	79	0-40	12	104-465	251
Dead trees	26	8.4-34.4	20.4	54-144	98	0-83	44	103-370	183

Falling and Log Identification

Trees were selected and cruised, then felled and bucked. The normal industry practice of bucking logs to maximize 32-foot lengths (woods-length logs) was followed. Total length and diameter of each tree and length of each bucked log were recorded. The end of each log was identified by tree number and log within the tree. The log number was used to identify lumber items by the log of origin.

Scaling

After all the logs were delivered to the millyard, they were rolled out and scaled according to Forest Service Scaling Handbook rules (USDA Forest Service 1973). In addition, measurements were taken that provided information for the application of several methods of determining cubic volume (USDA Forest Service 1978). Scribner log scale was used during the sawing phase when logs were scaled on the log deck.

Lumber Manufacturing

Each log was sawn to recover its optimum value through manufacture of the mill's usual lumber items. Production equipment included two single-cut bandsaws mounted with vertical edgers, a sash gangsaw, and bank of trim saws. Log size determined which side of the mill was used for initial breakdown.

Research methodology on product yield has been developed for application at near-production conditions in most mills. These study techniques use a numerical sequence and color codes to maintain identity of each product throughout the sawing and planing phases. A quality inspector from Western Wood Products Association supervised the grading of the surfaced-dry lumber. A series of data records--hand tallies, cassette tape, black and white film, or television tapes--were used to ensure accuracy of the recorded information. Final point of tally was surfaced-dry lumber ready for shipment.

Table 2 shows surfaced-dry lumber tally volume for the items cut in the study.

Table 2--Lumber item and surfaced-dry
volume for all live logs

Size	Volume
Inches	Board feet
Shops:	
5/4	75,671
4/4	9,560
Boards:	
1x4	10,513
1x6	25,302
1x8	11,207
1x10	7,737
1x12	25,236
	165,226

Cubic Calculations

The gross cubic volume of logs was computed by Bruce's (1970) butt-log equation for butt logs and Smalian's formula for all other logs:

Smalian's formula: $0.002727 (D_S^2 + D_L^2) L.$

Butt-log equation: $\text{Volume} = 0.005454 (0.3677 D_S^2)$

$$+ 0.6688 (D_S \times D_L)$$

$$- 0.000148 (D_S \times D_L)L;$$

where: D_S is the log scaling diameter (inches) of the small end,

D_L is the log scaling diameter (inches) of the large end, and

L is the log scaling length (feet).

The cubic-foot volumes of lumber were based on measurements of surfaced-dry lumber. The cubic-foot volumes of sawdust were calculated from the average saw-kerf thickness and the rough-green surface area of the lumber from each log. Shrinkage and planer shavings were determined by subtracting the volume of surfaced-dry lumber from the volume of rough-green lumber. The residue volume was the gross log volume minus volumes of lumber, sawdust, shrinkage, and planer shavings. Thus, the residue volume includes a small amount of sawdust from the production of slabs, edgings, and trim ends.

Model Selection

Five regression models were compared for volume and value relationships. The models were different combinations of the independent variables D, 1/D, $1/D^2$. The final model was selected based on the statistics of the regression ($s_{y.x}$, the standard deviation about regression; and R^2, the coefficient of determination), each coefficient being significant ($P \leq 0.05$), and experience from fitting these models in previous studies.

Results

Lumber yields presented in tables 6 through 11 in the appendix are in board feet of surfaced-dry lumber (shipping tally volume). The cubic-foot volume of the logs, lumber, sawdust, and residues calculated for each log grade by 1-inch diameter classes is also shown.

Cubic Recovery

Cubic recovery percent (CR%) over diameter for all live logs is shown in figure 1.[1] Cubic recovery percent rises slowly in the lower diameters and tends to flatten in the upper limits. This is characteristic and is a result of cutting rectangular lumber from round logs. There was no significant relationship between cubic recovery and diameter for the dead logs. Increasing defect for increasing diameters in dead logs seems to account for the lower recovery in the upper diameters compared with live logs. This in turn balances the lower recoveries in the smaller diameters resulting in no significant relationship between percent recovery and diameter; therefore, an average recovery of 38 percent is appropriate.

Figure 2 presents the relationship between lumber recovery factor (LRF) and diameter.[2] The shape of the curve is similar to the curve for cubic recovery percent. The LRF weighted average recovery for the live logs is 7.13 and for the dead logs, 6.55.

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[1] Cubic recovery percent = surfaced-dry cubic-foot lumber volume divided by gross cubic-foot log volume times 100.

[2] LRF = board feet of lumber tally per cubic foot of gross log volume.
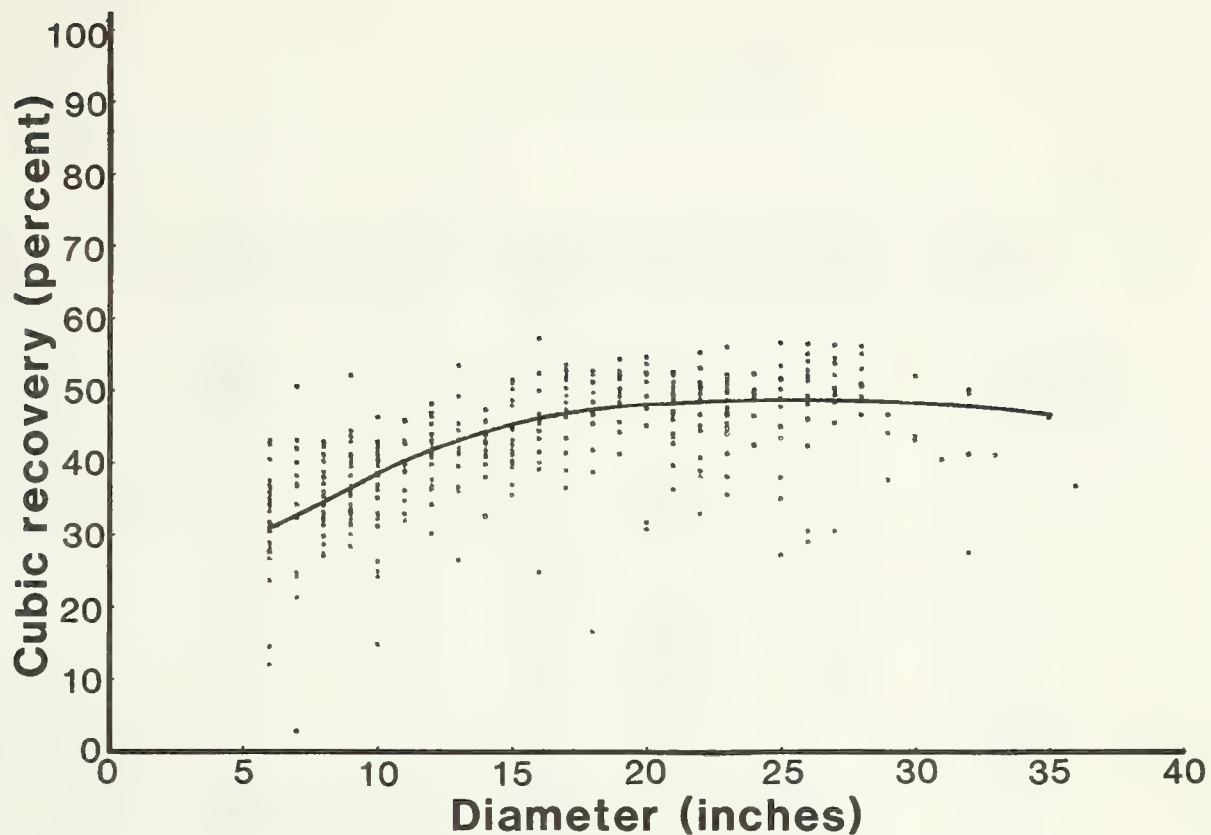
Figure 1.--Percent of cubic log volume produced as surfaced-dry lumber by log diameter, live ponderosa pine. (Cubic recovery percent = $87.4195 - 0.7119(D) - 576.9119 (1/D) + 1595.0388 (1/D^2)$. Coefficient of determination = 0.491. Standard deviation from regression = 6.62.)
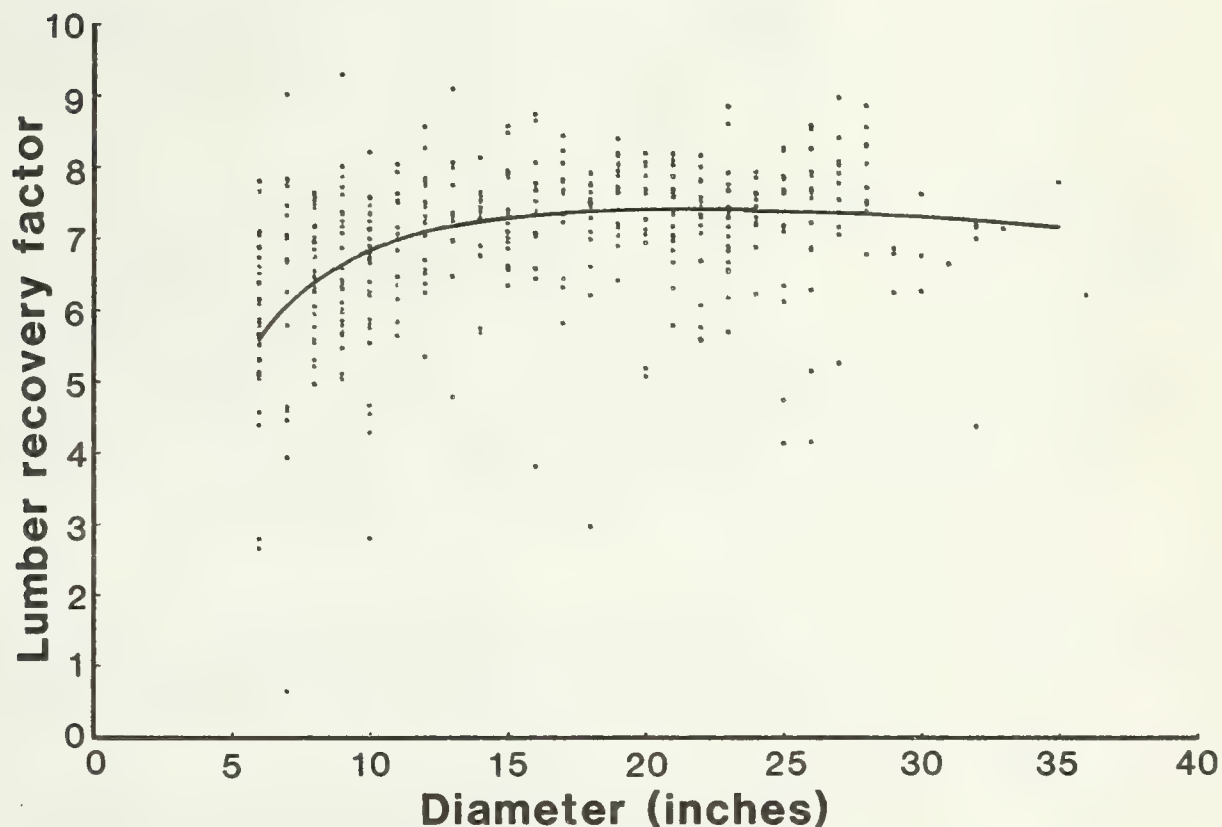
Figure 2.--Lumber recovery factor: Board feet of lumber tally per cubic foot of log by diameter, live ponderosa pine. (Lumber recovery factor = $9.4079 - 0.04658(D) - 21.1536(1/D)$. Coefficient of determination = 0.253. Standard deviation from regression = 1.067.)

Recovery Ratio

Recovery ratio (overrun) based on net log scale is shown in figure 3 for all live logs.[3/] This ratio decreases as diameter increases.

The relationship between recovery ratio and diameter for the dead logs was not statistically significant. The weighted average recovery was 160 percent for dead logs. Only the dead logs scaled as merchantable were included in this group, and they had a weighted average defect of 39 percent.
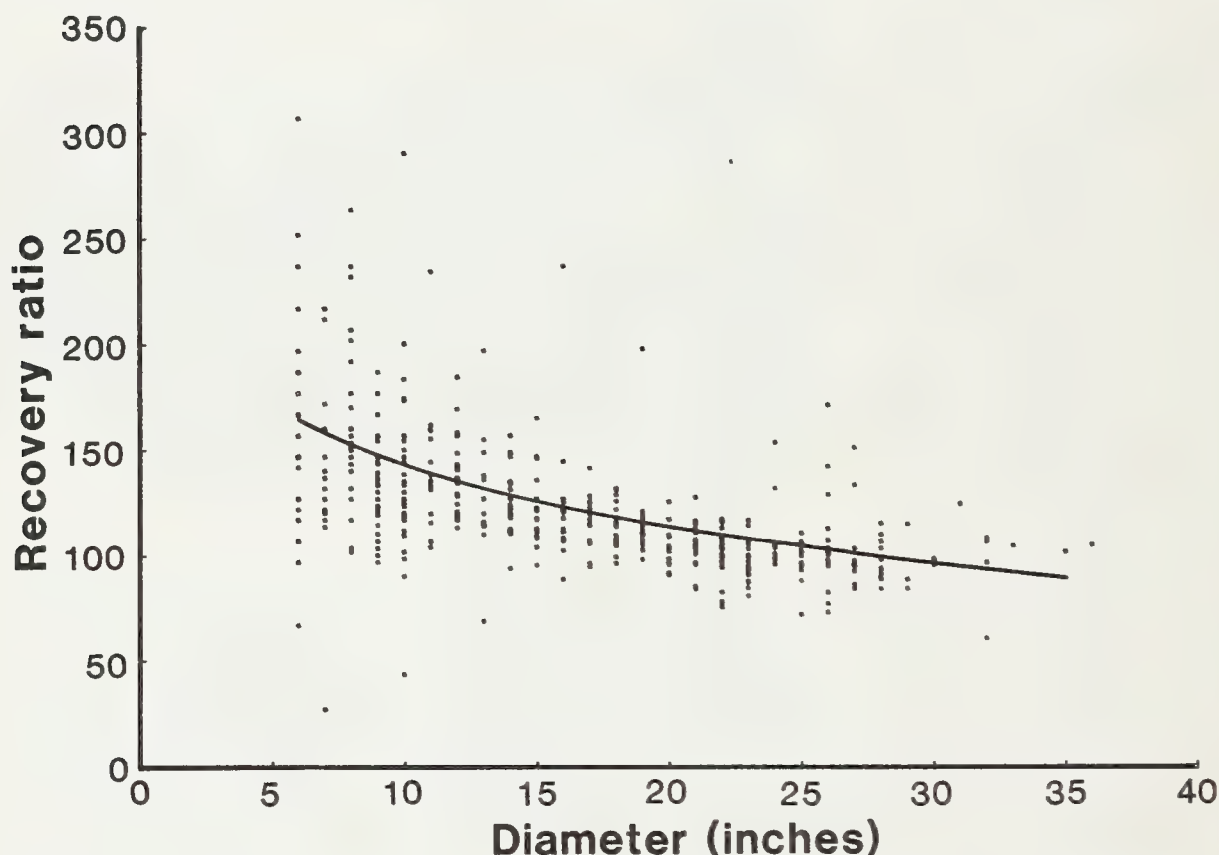
Figure 3.--Recovery ratio curve for all live ponderosa pine logs. (Recovery ratio = $106.7545 - 0.9471(D) + 568.3461(1/D) - 1116.9745(1/D^2)$. Coefficient of determination = 0.2533. Standard deviation from regression = 35.35.)

Grade Yields

Tables 12-17 in the appendix show percent of recovery for each lumber grade by 1-inch diameter classes by log grade and by all log grades combined. Dead logs are shown in table 16 but are not included in table 17 for all log grades.

[3/] Recovery ratio = lumber tally volume divided by net log scale volume times 100.
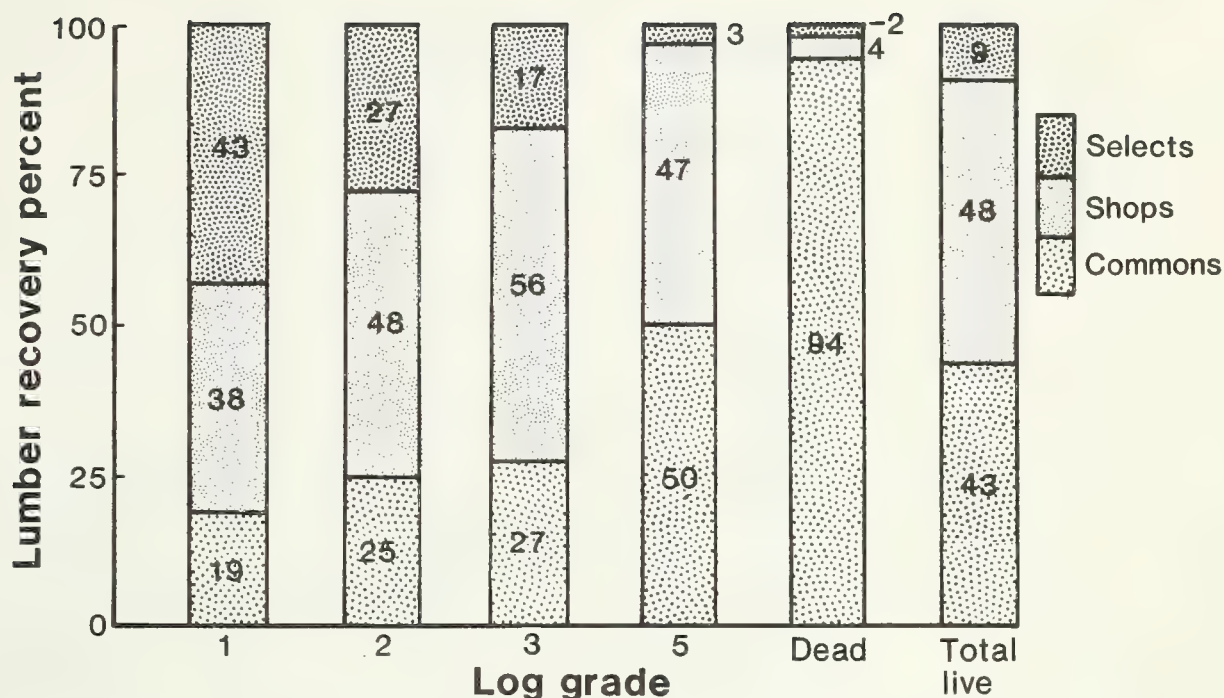
Figure 4.--Lumber grade yield as a percent of total lumber tally volume by log grade.

About 9 percent of the lumber produced from the logs in this study was in Select grades, 48 percent in Shop grades, and 43 percent in Common grades. Figure 4 presents recovery of Select, Shop, and Common lumber for the various log grades.

Value ($/MLT)

Figure 5 shows the relationship of dollars per thousand board feet of lumber tally ($/MLT) to diameter. These relationships are based on 1976 lumber prices (table 3), furnished by Region 1 of the USDA Forest Service. There was no statistically significant relationship between diameter and $/MLT for grades 1, 2, and 3; however, there is a significant difference between the arithmetic means of those grades. Grade 5 logs show an increase in unit value with increasing diameter, whereas the reverse is true for the dead logs.
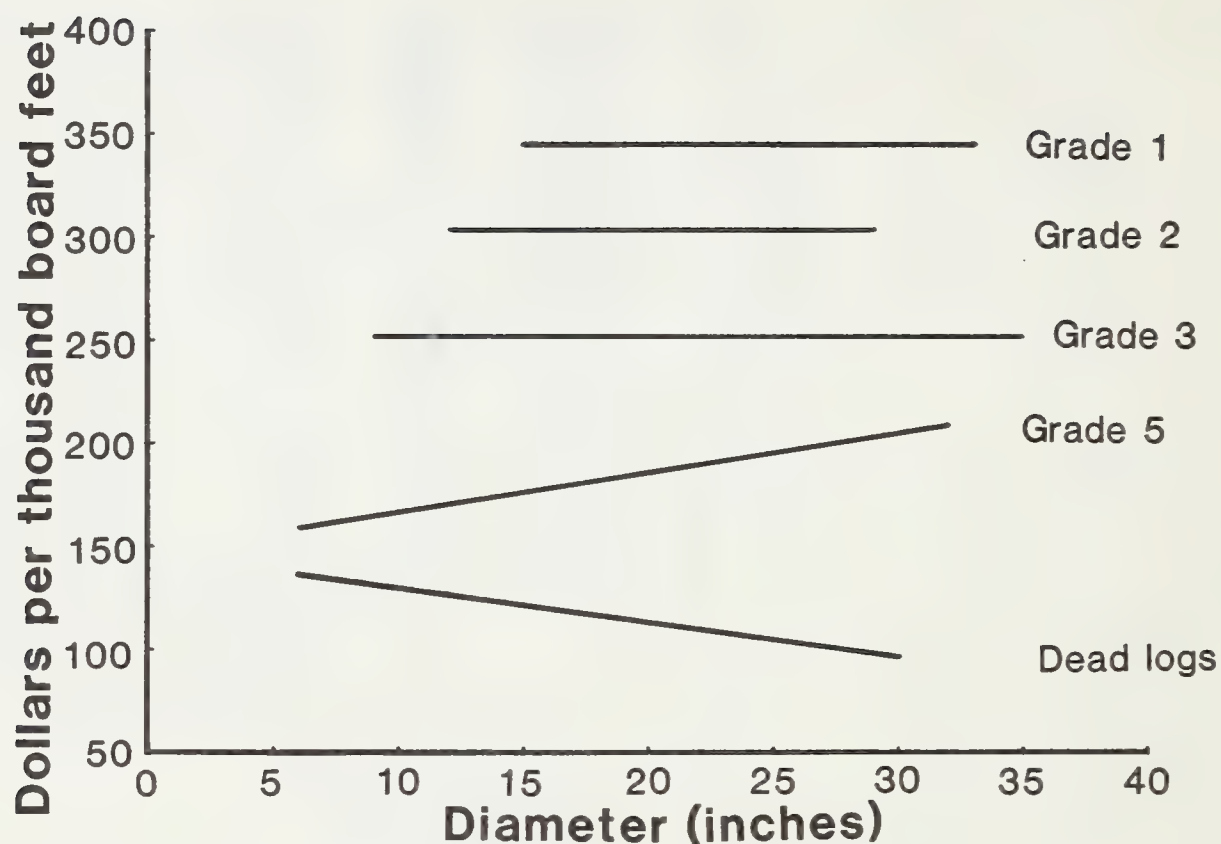
Figure 5.--Relationship of dollars per thousand board feet of lumber tally to diameter for each log grade, ponderosa pine.

Statistical information:

y (grade 1) = 345.90.
Standard error of the mean = 16.17.
y (grade 2) = 302.35.
Standard error of the mean = 9.32.
y (grade 3) = 251.91.
Standard error of the mean = 6.78.
y (grade 5) = 147.508 + 9038 (D).
Coefficient of determination = 0.070.
Standard deviation from regression = 40.48.
y (dead) = 146.8879 - 1.6896(D).
Coefficient of determination = 0.094.
Standard deviation from regression = 31.96.

Table 3--1976 lumber grade prices

Lumber grade	Thickness (inches)	
	4/4	5/4
	- - - -Dollars- - -	
B & Better Select	609.58	584.97
C Select	609.58	584.97
D Select	424.07	411.24
Moulding	224.68	431.40
3 Clear	236.47	237.70
1 Shop	148.56	260.83
2 Shop	148.56	195.08
3 Shop	--	146.25
Shop Out	--	146.25
2 & Better Common	235.83	--
3 Common	119.63	--
4 Common	79.50	--
5 Common	40.53	--
Pitch Select	411.24	411.24

Value ($/CCF)

Figure 6 shows the relationship of dollars per hundred cubic feet of gross log volume ($/CCF) to diameter for each log grade. There was no statistically significant relationship between diameter and $/CCF for grades 2 and 3, nor for the dead logs; however, there is a significant difference between the means of those grades.

Application

Many of the relationships in this report can be used in various ways. Data presented can also be used to develop other relationships; for example, board feet of lumber divided by cubic feet of lumber can be a useful tool in rating a mill's efficiency (Fahey and Woodfin 1976). Table 4 illustrates the relationship for three different widths of 1-inch boards.

This relationship also varies by size of rough-green lumber; a mill cutting to closer tolerances will attain the higher ratios, as shown in table 5.
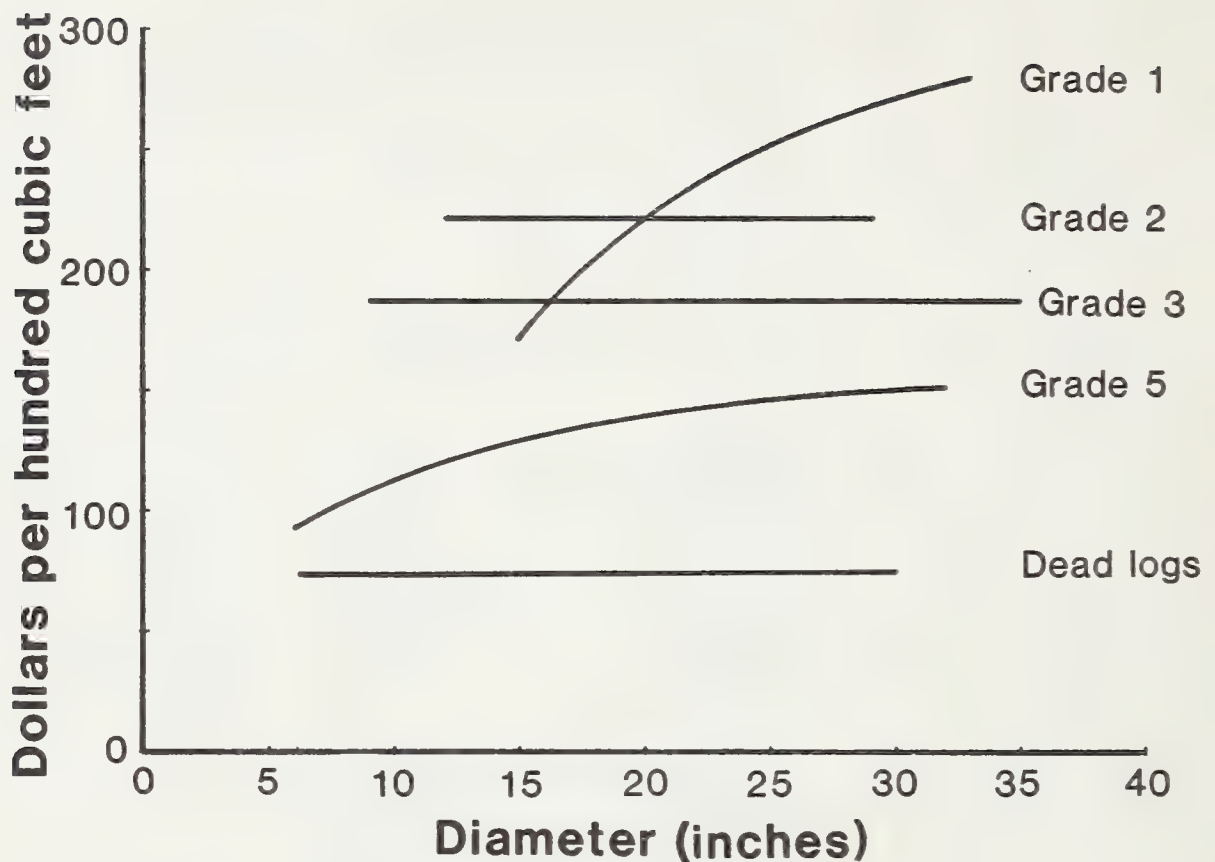
Figure 6.--Relationship of dollars per hundred cubic feet of log volume to diameter for each log grade, ponderosa pine.

Statistical information:

y (grade 1) = 370.606 - 2987.01(1/D).
Coefficient of determination = 0.247.
Standard deviation from regression = 57.77.
y (grade 2) = 223.14.
Standard error of the mean = 8.88.
y (grade 3) = 186.58.
Standard error of the mean = 5.56.
y (grade 5) = 147.825 - 808.1106(1/D) + 1893.1839(1/D^2).
Coefficient of determination = 0.204.
Standard deviation from regression = 34.24.
y (dead) = 79.19.
Standard error of the mean = 2.83.

The board-foot-per-cubic-foot (BF/CF) ratio calculated from table 11 for the live logs on a basis of surfaced-dry lumber was 15.67. By adding the cubic volume of shrinkage and planer shavings to the surfaced-dry cubic volume of lumber, the ratio can be computed on the basis of rough-green lumber--in this case, 11.08. This ratio and the data obtained from similar publications and reports will allow comparisons of mill efficiency. Multiplying BF/CF ratio of 15.67 by the cubic recovery percent (46) will equal the recovery factor for surfaced-dry lumber.

Table 4--Board-foot:cubic-foot ratios for various sizes of surfaced-dry lumber

Item, nominal size	Surfaced-dry size	Board feet per linear foot		Cubic feet per linear foot		Board feet per cubic foot
1 x 4	0.75 x 3.5	0.333	÷	0.018	=	18.5
1 x 6	.75 x 5.5	.50	÷	.029	=	17.2
1 x 12	.75 x 11.25	1.0	÷	.059	=	16.9
5/4 x 12	1.16 x 12.0	1.25	÷	.097	=	12.9

Table 5--Board foot:cubic foot ratios for various sizes of rough-green lumber

Item, nominal size	Rough-green size	Board feet per linear foot		Cubic feet per linear foot		Board feet per cubic foot
1 x 4	0.969 x 4.125	0.333	÷	0.028	=	11.9
Closer tolerance	.906 x 3.875	.333	÷	.024	=	13.9
1 x 6	.969 x 6.125	.50	÷	.041	=	12.2
Closer tolerance	.906 x 5.875	.50	÷	.037	=	13.5
1 x 12	.969 x 12.0	1.0	÷	.081	=	12.3
Closer tolerance	.906 x 11.75	1.0	÷	.074	=	13.5
5/4 x 12	1.5 x 12.25	1.25	÷	.128	=	9.8
Closer tolerance	1.375 x 12.0	1.25	÷	.115	=	10.9

To adapt information published about a mill to a mill that is similarly cutting logs:

1. Carefully measure a sample of the various lumber items to determine a BF/CF ratio. For instance, use a ratio of 9.91 and a green cubic recovery percent of 65.

2. LRF = (BF/CF)(CR%).
    LRF = (9.91)(0.65).
    LRF = 6.44.

Point 2 illustrates that an improvement in the LRF could be obtained by cutting to closer tolerances. If a mill cuts items in a different relationship than those in published reports, compute the BF/CF ratios for individual items, calculate an average BF/CF weighted by dimension, and then proceed with the LRF calculation.

Metric Equivalents

1 inch = 2.540 centimeters
1 foot = 0.305 meter
1 cubic foot = 0.028 cubic meter

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Appendix

Table 6—Log scale, lumber tally, and cubic volumes by scaling diameter, log grade 1, mill-length, ponderosa pine logs

Log scaling diameter[1]	Number of logs	Scribner log scale		Lumber tally		Volume[3]					
		Gross	Net	Volume	Recovery ratio[2]	Log	Surfaced-dry lumber	Lumber recovery ratio[4]	Sawdust	Shrinkage and planer shavings	Residue
Inches		- - - - -Board feet- - - -			Percent	- - -Cubic feet- - -		Percent	- - - - -Cubic feet- - - - -		
15	1	140	110	165	150	20.73	10.14	49	2.64	4.37	3.58
16	1	160	100	92	92	23.53	6.05	26	1.44	2.63	13.41
17	—	—	—	—	—	—	—	—	—	—	—
18	—	—	—	—	—	—	—	—	—	—	—
19	1	240	210	231	110	32.98	14.92	45	3.59	6.24	8.23
20	—	—	—	—	—	—	—	—	—	—	—
21	1	300	280	330	118	41.34	19.45	47	5.45	7.93	8.51
22	—	—	—	—	—	—	—	—	—	—	—
23	1	380	280	286	102	49.34	18.04	37	4.54	7.46	19.30
24	1	400	400	435	109	54.63	27.47	50	6.93	11.36	8.87
25	2	920	830	861	104	114.70	51.99	45	13.99	20.85	27.87
26	3	1,370	1,280	1,278	100	170.06	77.94	46	20.94	32.25	38.93
27	1	550	230	354	154	65.95	20.81	32	5.98	8.75	30.41
28	2	1,160	1,110	1,245	112	143.32	77.68	54	19.82	31.24	14.58
29	1	610	410	482	118	75.96	29.41	39	7.83	11.90	26.82
30	—	—	—	—	—	—	—	—	—	—	—
31	—	—	—	—	—	—	—	—	—	—	—
32	1	740	590	655	111	92.31	39.09	42	10.64	15.50	27.08
33	1	780	660	716	108	98.11	41.72	43	12.09	17.34	26.96
Total or average	17	7,750	6,490	7,130	110	982.96	434.71	44	115.88	177.82	254.55

[1]/In accordance with National Forest Log Scaling Handbook rules.
[2]/Equals lumber tally volume divided by net log scale times 100.
[3]/Lumber volume based on surfaced-dry dimensions. Chippable volume based on rough-green dimensions. Residue equals gross log volume minus lumber, sawdust, and shrinkage and planer shavings volume.
[4]/Equals cubic lumber volume divided by cubic log volume times 100.

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Table 7--Log scale, lumber tally, and cubic volumes by scaling diameter, log grade 2, mill-length, ponderosa pine logs

Log scaling diameter[1]	Number of logs	Scribner log scale		Lumber tally		Volume[3]					
		Gross	Net	Volume	Recovery ratio[2]	Log	Surfaced-dry lumber	Lumber recovery ratio[4]	Sawdust	Shrinkage and planer shavings	Residue
Inches		- - -Board feet- - -			Percent	- - -Cubic feet- - -		Percent	- - - - - - -Cubic feet- - - - - - -		
12	1	80	60	73	122	13.40	4.16	31	1.30	1.85	6.09
--	--	--	--	--	--	--	--	--	--	--	--
14	2	220	220	273	124	36.74	16.08	44	4.62	7.00	9.04
15	2	280	270	305	113	41.72	18.10	43	5.25	7.93	10.44
16	--	--	--	--	--	--	--	--	--	--	--
17	2	360	360	422	117	53.25	25.76	48	6.81	10.52	10.16
18	2	420	380	453	119	59.54	29.92	50	7.00	12.44	10.18
19	2	480	480	525	109	69.04	33.49	49	8.29	14.01	13.25
20	1	280	180	189	105	36.48	11.60	32	3.06	4.84	16.98
21	4	1,200	1,140	1,249	110	162.22	80.31	50	19.40	32.73	29.78
22	5	1,650	1,550	1,639	106	222.51	107.09	48	25.10	43.24	47.08
23	5	1,900	1,860	1,858	100	245.13	116.69	48	29.56	47.62	51.26
24	1	400	400	396	99	52.40	26.52	51	5.96	10.91	9.01
25	4	1,670	1,290	1,216	94	207.19	76.10	37	19.50	31.42	80.17
26	5	2,500	1,970	2,249	114	308.63	147.82	48	34.35	59.82	66.64
27	2	1,100	1,090	1,115	102	134.94	68.22	51	17.97	27.65	21.10
28	3	1,740	1,690	1,591	94	211.06	106.70	51	23.80	42.92	37.64
29	1	610	590	540	92	77.60	35.11	45	8.29	14.24	19.96
30	--	--	--	--	--	--	--	--	--	--	--
31	--	--	--	--	--	--	--	--	--	--	--
32	--	--	--	--	--	--	--	--	--	--	--
33	--	--	--	--	--	--	--	--	--	--	--
34	--	--	--	--	--	--	--	--	--	--	--
35	--	--	--	--	--	--	--	--	--	--	--
36	1	920	680	735	108	116.57	44.17	38	11.93	17.49	42.98
Total or average	43	15,810	14,210	14,828	104	2,048.42	947.84	46	232.19	386.63	481.76

[1]/In accordance with National Forest Log Scaling Handbook rules.
[2]/Equals lumber tally volume divided by net log scale times 100.
[3]/Lumber volume based on surfaced-dry dimensions. Chippable volume based on rough-green dimensions. Residue equals gross log volume minus lumber, sawdust, and shrinkage and planer shavings volume.
[4]/Equals cubic lumber volume divided by cubic log volume times 100.

Table 8--Log scale, lumber tally, and cubic volumes by scaling diameter, log grade 3, mill-length, ponderosa pine logs

Log scaling diameter[1]	Number of logs	Scribner log scale		Lumber tally		Volume[3]					
		Gross	Net	Volume	Recovery ratio[2]	Log	Surfaced-dry lumber	Lumber recovery ratio[4]	Sawdust	Shrinkage and planer shavings	Residue
Inches		- - - -Board feet- - - -			Percent	- - - -Cubic feet- - - -		Percent	- - - - - - - -Cubic feet- - - - - - - -		
9	2	70	60	73	122	13.00	4.04	31	1.33	1.92	5.71
10	2	100	100	128	128	17.84	7.21	40	2.29	3.25	5.09
11	2	140	130	179	138	23.86	10.17	43	3.23	4.60	5.86
12	2	160	150	229	153	28.24	12.96	46	4.07	5.96	5.42
13	1	100	100	117	117	15.93	7.24	45	1.94	3.22	3.53
14	3	320	320	356	111	53.07	20.82	39	6.18	9.21	16.86
15	2	280	230	324	141	43.16	19.09	44	5.50	8.29	10.28
16	4	640	610	781	128	93.22	47.82	51	12.85	20.40	12.15
17	1	180	160	205	128	26.50	11.76	44	3.44	4.81	6.49
18	2	420	240	313	130	60.31	19.54	32	5.02	8.21	27.54
19	6	1,440	1,440	1,600	111	204.35	107.59	53	23.80	44.21	28.84
20	4	1,120	1,030	1,050	102	151.23	69.62	46	15.94	28.40	37.27
21	8	2,400	2,280	2,460	108	333.86	161.92	48	37.20	65.25	69.49
22	6	1,900	1,880	1,871	100	256.56	124.03	48	28.36	50.86	53.31
23	8	3,040	2,910	2,837	101	395.17	191.93	49	45.03	77.33	80.88
24	5	2,000	1,720	2,025	118	267.86	131.88	49	31.35	54.22	50.41
25	7	3,160	2,960	2,976	101	393.89	195.68	50	45.50	80.21	72.50
26	5	2,500	2,210	2,332	106	311.55	160.32	51	34.16	65.15	51.92
27	5	2,750	2,640	2,686	102	335.48	180.49	54	40.09	73.00	41.90
28	2	1,160	1,140	1,175	103	144.35	72.55	50	18.73	28.98	24.09
29	1	610	600	523	87	75.96	36.30	48	7.52	14.44	17.70
30	2	1,320	1,090	1,096	100	165.84	73.93	45	16.20	30.01	45.70
31	1	710	460	585	127	86.61	36.04	42	9.41	14.78	26.38
32	2	1,480	1,300	1,356	104	186.31	95.16	51	19.39	38.41	33.35
33	--	--	--	--	--	--	--	--	--	--	--
34	--	--	--	--	--	--	--	--	--	--	--
35	1	880	830	869	105	110.00	52.25	48	13.98	20.50	23.27
Total or average	84	28,880	26,590	28,246	106	3,794.15	1,850.34	49	432.51	755.62	755.94

1/ In accordance with National Forest Log Scaling Handbook rules.
2/ Equals lumber tally volume divided by net log scale times 100.
3/ Lumber volume based on surfaced-dry dimensions. Chippable volume based on rough-green dimensions. Residue equals gross log volume minus lumber, sawdust, and shrinkage and planer shavings volume.
4/ Equals cubic lumber volume divided by cubic log volume times 100.

Table 9--Log scale, lumber tally, and cubic volumes by scaling diameter, log grade 5, mill-length, ponderosa pine logs

Log scaling diameter[1]	Number of logs	Scribner log scale		Lumber tally		Volume [3]					
		Gross	Net	Volume	Recovery ratio[2]	Log	Surfaced-dry lumber	Lumber recovery ratio[4]	Sawdust	Shrinkage and planer shavings	Residue
Inches		- - - - Board feet - - -			Percent	- - -Cubic feet- - -		Percent	- - - - - - - - - - - - -Cubic feet- - - - - - - - - -		
6	123	1,480	1,450	2,389	165	425.17	130.82	31	45.81	67.92	180.62
7	80	1,720	1,640	2,300	140	383.47	126.01	33	43.76	64.78	148.92
8	68	1,780	1,690	2,687	159	420.33	150.10	36	49.98	72.62	147.63
9	66	2,310	2,250	3,233	144	478.28	183.43	38	58.65	83.86	152.34
10	64	3,250	3,140	4,202	134	628.75	239.17	38	75.56	107.82	206.20
11	55	3,370	3,250	4,558	140	660.99	261.98	40	80.76	116.50	201.75
12	53	3,740	3,640	4,814	132	700.86	276.73	39	84.44	122.29	217.40
13	28	2,470	2,460	3,332	135	446.74	195.38	44	56.84	85.20	109.32
14	44	4,350	4,170	5,510	132	764.71	324.68	42	93.18	139.03	207.82
15	38	4,470	4,600	5,691	124	767.50	349.13	46	92.75	148.06	177.39
16	39	5,960	5,760	7,145	124	950.42	446.26	47	113.84	185.72	204.60
17	37	6,220	6,030	7,322	121	971.62	476.86	49	112.50	195.72	186.54
18	29	5,650	5,430	6,522	120	877.09	426.02	49	99.67	172.29	179.11
19	28	6,090	5,880	6,880	117	889.21	451.01	51	104.24	179.66	154.30
20	23	6,180	5,870	6,416	109	851.63	424.87	50	96.23	169.05	161.48
21	24	6,560	6,470	6,611	102	925.26	443.57	48	98.28	176.99	206.42
22	22	6,960	6,560	7,537	115	987.82	505.77	51	111.90	200.49	169.66
23	16	5,430	5,370	5,416	101	723.16	368.32	51	79.73	147.87	127.24
24	14	5,200	5,080	5,204	102	698.75	354.57	51	76.07	141.53	126.58
25	15	6,430	6,030	6,046	100	822.54	412.29	50	89.09	166.57	154.59
26	8	3,750	3,680	3,460	94	470.72	238.33	51	50.53	96.01	85.85
27	6	3,300	3,180	3,079	97	399.91	204.18	51	46.22	81.90	67.61
28	5	2,900	2,860	2,861	100	356.12	198.13	56	41.28	79.12	37.59
29	2	1,220	1,030	719	70	160.01	49.43	31	10.42	19.69	80.47
30	1	660	660	649	98	83.95	44.67	53	9.37	17.87	12.04
31	--	--	--	--	--	--	--	--	--	--	--
32	1	740	690	439	64	98.13	28.11	29	6.81	11.30	51.91
Total or average	889	102,490	98,870	115,022	116	15,943.14	7,309.99	46	1,827.91	3,049.86	3,755.38

1/ In accordance with National Forest Log Scaling Handbook rules.
2/ Equals lumber tally volume divided by net log scale times 100.
3/ Lumber volume based on surfaced-dry dimensions. Chippable volume based on rough-green dimensions. Residue equals gross log volume minus lumber, sawdust, and shrinkage and planer shavings volume.
4/ Equals cubic lumber volume divided by cubic log volume times 100.

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Table 10--Log scale, lumber tally, and cubic volumes by scaling diameter, mill-length, dead ponderosa pine logs

Log scaling diameter [1]	Number of logs	Scribner log scale		Lumber tally		Volume [3]					
		Gross	Net	Volume	Recovery ratio [2]	Log	Surfaced-dry lumber	Lumber recovery ratio [4]	Sawdust	Shrinkage and planer shavings	Residue
Inches		- - -Board feet- - - -			Percent	- - Cubic feet - -	- - Cubic feet - -	Percent	- - - -	- - -Cubic feet- - - -	- - -
6	5	50	50	77	154	12.73	4.19	33	1.46	2.19	4.89
7	4	70	70	121	173	15.97	6.74	42	2.27	3.33	3.63
8	7	170	140	257	184	43.27	14.04	32	4.87	7.21	17.15
9	8	290	180	354	197	61.44	19.70	32	6.55	9.53	25.66
10	2	90	80	134	167	1.44	7.64	41	2.39	3.40	5.01
11	7	430	290	598	206	86.44	33.88	39	10.69	15.26	26.61
12	7	460	310	558	180	87.99	31.61	36	10.01	14.28	32.09
13	7	560	390	619	159	97.01	35.19	36	10.93	15.54	35.35
14	7	680	420	780	186	110.07	45.35	41	13.45	19.70	31.57
15	8	1,020	540	1,023	189	159.21	58.37	37	17.78	25.15	57.91
16	4	520	310	543	175	77.01	31.32	41	9.22	13.03	23.44
17	8	1,380	940	1,470	156	219.76	85.39	39	24.78	35.51	74.08
18	3	530	270	351	130	77.04	20.03	26	6.19	8.77	42.05
19	--	--	--	--	--	--	--	--	--	--	--
20	3	800	400	669	167	110.99	38.60	35	11.41	16.28	44.70
21	4	1,200	750	1,139	152	172.61	66.75	39	18.93	27.20	59.73
22	1	330	110	209	190	46.25	11.85	26	3.67	5.26	25.47
23	--	--	--	--	--	--	--	--	--	--	--
24	4	1,550	770	1,343	174	212.69	78.03	37	22.58	31.82	80.26
25	--	--	--	--	--	--	--	--	--	--	--
26	2	1,000	460	718	156	123.97	41.50	33	12.07	16.74	53.66
27	2	820	630	820	130	100.20	47.77	48	13.64	18.79	20.00
28	--	--	--	--	--	--	--	--	--	--	--
29	1	610	490	566	116	75.97	32.85	43	9.46	13.11	20.55
30	1	660	530	679	128	81.23	39.41	49	11.36	15.69	14.77
Total or average	95	13,220	8,130	13,028	160	1,990.29	750.21	38	223.71	317.79	698.58

1/ In accordance with National Forest Log Scaling Handbook rules.
2/ Equals lumber tally volume divided by net log scale times 100.
3/ Lumber volume based on surfaced-dry dimensions. Chippable volume based on rough-green dimensions. Residue equals gross log volume minus lumber, sawdust, and shrinkage and planer shavings volume.
4/ Equals cubic lumber volume divided by cubic log volume times 100.

Table 11--Log scale, lumber tally, and cubic volumes by scaling diameter, all log grades combined for live, mill-length, ponderosa pine logs

Log scaling diameter[1]	Number of logs	Scribner log scale		Lumber tally		Volume[3]					
		Gross	Net	Volume	Recovery ratio[2]	Log	Surfaced-dry lumber	Lumber recovery ratio[4]	Sawdust	Shrinkage and planer shavings	Residue
Inches		- - - - -Board feet- - - -			Percent	- - -Cubic feet- -		Percent	- - - - -	- - -Cubic feet- - -	- - - -
6	123	1,480	1,450	2,389	165	425.17	130.82	31	46.78	67.92	179.65
7	80	1,720	1,640	2,300	140	383.47	126.01	33	43.76	64.78	148.92
8	68	1,780	1,690	2,687	159	420.33	150.10	36	49.98	72.62	147.63
9	68	2,380	2,310	3,306	143	491.28	187.47	38	59.98	85.78	158.05
10	66	3,350	3,240	4,330	134	646.59	246.38	38	77.85	111.07	211.29
11	57	3,510	3,380	4,737	140	684.85	272.15	40	83.99	121.10	207.61
12	56	3,980	3,850	5,116	133	742.50	293.85	40	89.81	129.93	228.91
13	29	2,570	2,560	3,449	135	462.67	202.62	44	58.78	88.42	118.85
14	49	4,890	4,710	6,139	130	854.52	361.58	42	103.98	155.24	233.72
15	43	5,470	5,210	6,485	124	873.11	396.63	45	106.14	168.65	201.69
16	44	6,760	6,470	8,018	124	1,067.17	500.13	47	128.13	208.75	230.16
17	40	6,760	6,550	7,949	121	1,051.37	514.38	49	122.75	211.05	203.19
18	33	6,490	6,050	7,288	120	996.94	475.48	48	111.69	192.94	216.83
19	37	8,250	8,010	9,236	115	1,195.58	607.01	51	139.92	244.03	204.62
20	28	7,580	7,080	7,655	108	1,039.34	506.09	49	115.23	202.29	215.73
21	37	10,460	10,170	10,650	105	1,462.68	705.25	48	160.33	282.90	314.20
22	33	10,510	9,990	11,047	111	1,466.89	736.89	50	165.36	294.59	270.05
23	30	10,750	10,420	10,497	101	1,412.80	694.98	49	158.86	280.28	278.68
24	21	8,000	7,600	8,060	106	1,073.64	540.44	50	120.31	218.02	194.87
25	28	12,180	11,110	11,099	100	1,538.32	736.06	48	168.08	299.05	335.13
26	21	10,120	9,140	9,319	102	1,260.96	624.41	50	139.98	253.23	243.34
27	14	7,700	7,070	7,234	102	936.28	473.70	51	110.26	191.30	161.02
28	12	6,960	6,800	6,872	101	854.85	455.06	53	103.63	182.26	113.90
29	5	3,050	2,630	2,264	86	389.53	150.25	39	34.06	60.27	144.95
30	3	1,980	1,750	1,745	100	249.79	118.60	47	25.57	47.88	57.74
31	1	710	460	585	127	86.61	36.04	42	9.41	14.78	26.38
32	4	2,960	2,580	2,450	95	376.75	162.36	43	36.84	65.21	112.34
33	1	780	660	716	108	98.11	41.72	43	12.09	17.34	26.96
34	--	--	--	--	--	--	--	--	--	--	--
35	1	880	830	869	105	110.00	52.25	47	13.98	20.50	23.27
36	1	920	680	735	108	116.57	44.17	38	11.93	17.49	42.98
Total or average	1,033	154,930	146,160	165,226	113	22,768.67	10,542.88	46	2,608.49	4,369.67	5,247.63

1/In accordance with National Forest Log Scaling Handbook rules.
2/Equals lumber tally volume divided by net log scale times 100.
3/Lumber volume based on surfaced-dry dimensions. Chippable volume based on rough-green dimensions. Residue equals gross log volume minus lumber, sawdust, and shrinkage and planer shavings volume.
4/Equals cubic lumber volume divided by cubic log volume times 100.

Table 12—Lumber grade recovery as a percentage of surfaced-dry lumber tally volume, log grade 1, mill-length, ponderosa pine logs

Log scaling diameter	Number of logs	Total lumber tally	B & Better Select	C Select	D Select	Mould-ing	3 Clear	1 Shop	2 Shop	3 Shop	Shop Out	2 & Better Common	3 Common	4 Common	5 Common	Pitch Select
Inches		Board feet								Percent of total lumber tally						
15	1	165	2.42	--	10.91	7.88	--	4.85	--	9.09	10.30	--	27.27	4.24	--	23.03
16	1	92	--	--	17.39	32.61	--	3.26	--	6.52	18.48	6.52	11.96	3.26	--	--
17	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
19	1	231	4.33	--	10.39	50.65	--	--	7.36	12.99	--	--	2.60	6.06	5.63	--
20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
21	1	330	12.73	7.27	1.82	28.18	--	2.42	8.79	--	--	8.18	16.06	--	--	14.55
22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
23	1	286	16.43	24.13	12.59	25.17	--	12.87	--	--	6.99	--	4.90	6.99	2.80	--
24	1	435	10.57	13.79	13.79	17.01	--	--	13.79	4.37	--	7.36	5.52	.92	--	--
25	2	861	5.34	6.04	11.27	18.70	--	--	--	6.74	--	12.54	12.31	14.75	2.09	10.22
26	3	1,278	15.18	23.87	14.95	25.74	--	--	5.40	3.21	--	1.17	5.56	3.52	.31	1.10
27	1	354	19.77	25.42	5.65	36.72	--	6.50	--	--	--	--	1.13	3.95	.85	--
28	2	1,245	4.50	11.81	8.43	25.62	--	5.46	4.90	5.62	1.20	1.69	13.49	3.13	--	14.14
29	1	482	5.39	13.28	19.92	27.18	--	15.15	4.77	6.22	--	2.28	.83	1.87	3.11	--
30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
31	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
32	1	655	8.70	16.18	11.15	25.95	--	--	5.95	--	--	--	6.11	10.99	7.63	7.33
33	1	716	22.35	18.44	16.06	17.46	--	7.68	6.01	--	--	--	4.19	7.82	--	--
Total or average	17	7,130	10.63	14.71	12.02	24.74	--	4.12	4.78	3.77	.97	3.17	8.19	5.74	1.37	5.78

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Table 13—Lumber grade recovery as a percentage of **surfaced-dry** lumber tally volume, log grade 2, mill-length, ponderosa pine logs

Log scaling diameter	Number of logs	Total lumber tally	B & Better Select	C Select	D Select	Mould- ing	3 Clear	1 Shop	2 Shop	3 Shop	Shop Out	2 & Better Common	3 Common	4 Common	5 Common	Pitch Select
Inches		Board feet	- Percent of total lumber tally -													
12	1	73	--	4.11	30.14	21.92	--	--	--	--	--	34.25	--	9.59	--	--
13	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
14	2	273	4.03	10.99	6.59	20.88	--	--	4.76	--	--	29.67	6.96	--	--	--
15	2	305	1.97	20.33	20.33	6.56	--	5.90	--	3.28	--	15.74	20.00	5.90	--	16.12
16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
17	2	422	4.27	4.27	24.41	12.32	--	9.48	4.03	--	--	16.82	23.46	--	0.95	--
18	2	453	5.08	9.49	8.17	38.19	--	7.28	13.25	5.08	--	2.87	7.06	2.65	.88	--
19	2	525	14.67	7.81	12.76	12.57	--	3.24	10.29	12.76	--	13.52	10.48	--	--	1.90
20	1	189	--	16.40	9.52	46.03	--	--	--	9.52	--	--	3.17	12.17	3.17	--
21	4	1,249	3.36	9.13	12.57	18.98	--	6.33	17.93	7.69	--	5.20	7.93	8.97	--	1.92
22	5	1,639	4.76	9.40	10.13	24.95	--	6.22	12.51	8.05	1.16	4.58	10.68	6.47	.49	.61
23	5	1,858	6.78	10.71	19.00	29.66	--	1.83	5.54	2.26	--	5.87	13.46	1.67	.43	2.80
24	1	396	--	3.79	5.30	5.81	--	--	2.02	53.03	--	2.02	1.77	15.15	--	11.11
25	4	1,216	1.56	11.27	13.57	16.12	--	3.95	10.94	9.54	--	3.78	4.28	8.14	12.25	4.61
26	5	2,249	6.85	11.16	8.85	25.30	--	4.80	12.89	7.56	.93	3.73	5.60	8.49	2.13	1.69
27	2	1,115	--	5.11	17.94	39.10	--	3.32	7.62	3.59	--	1.52	12.02	6.55	.99	2.24
28	3	1,591	--	2.33	6.91	23.38	1.26	5.53	22.12	12.88	2.51	.88	6.54	9.93	2.26	3.46
29	1	540	15.56	21.48	4.26	8.89	--	9.63	22.59	3.15	--	--	2.22	6.11	6.11	--
30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
31	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
33	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
34	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
35	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
36	1	735	--	--	1.36	4.63	--	3.54	10.20	4.22	9.93	--	22.86	36.87	6.39	--
Total or average	43	14,828	4.30	8.82	11.67	22.57	.13	4.60	11.74	7.94	1.03	4.90	9.43	8.05	2.39	2.41

Table 14--Lumber grade recovery as a percentage of surfaced-dry lumber tally volume, log grade 3, mill-length, ponderosa pine logs

Log scaling diameter	Number of logs	Total lumber tally	B & Better Select	C Select	D Select	Mould-ing	3 Clear	1 Shop	2 Shop	3 Shop	Shop Out	2 & Better Common	3 Common	4 Common	5 Common	Pitch Select
Inches		Board feet	- - - - - - - - - - - - - - Percent of total lumber tally - - - - - - - - - - - - - -													
9	2	73	--	4.11	17.81	9.59	--	--	--	--	--	12.33	38.36	15.07	2.74	--
10	2	128	--	--	7.03	15.63	--	--	--	--	--	44.53	32.81	--	--	--
11	2	179	4.47	3.35	18.44	4.47	--	--	--	--	--	10.61	45.25	13.41	--	--
12	2	229	--	6.99	24.89	16.59	--	--	--	--	--	14.85	36.68	--	--	--
13	1	117	--	--	--	8.55	--	--	8.55	23.08	--	24.79	35.04	--	--	--
14	3	356	--	11.52	25.84	7.02	--	4.21	3.09	8.99	--	8.99	16.85	11.52	1.97	--
15	2	324	--	7.10	8.02	18.52	--	1.23	8.33	--	3.09	1.23	42.28	.93	7.10	2.16
16	4	781	--	12.55	13.70	22.15	--	.64	11.40	8.58	--	13.57	13.83	2.94	.64	--
17	1	205	--	--	3.41	3.90	--	--	--	--	--	--	4.88	80.98	2.93	3.90
18	2	313	--	2.24	4.15	28.75	--	4.79	19.17	4.15	2.56	--	27.80	3.51	2.88	--
19	6	1,600	--	5.94	4.37	14.06	--	9.50	29.87	11.56	--	14.87	9.56	.25	--	--
20	4	1,050	--	2.19	6.10	15.33	--	9.62	24.10	10.67	1.43	11.52	4.29	14.76	.65	--
21	8	2,460	1.10	7.20	11.34	17.20	--	4.31	16.14	16.06	1.50	7.85	10.37	6.30	--	--
22	6	1,871	.59	7.11	12.61	20.63	--	6.57	21.97	9.73	--	5.61	10.37	4.81	--	--
23	8	2,937	.92	7.15	12.33	18.93	1.88	3.75	21.48	5.45	2.49	4.90	11.07	9.16	2.08	.31
24	5	2,025	3.75	8.64	10.47	20.20	--	7.65	9.19	5.68	4.74	.40	13.58	11.26	.25	2.32
25	7	2,976	1.78	5.24	5.41	17.24	.77	7.56	18.62	16.87	2.65	2.28	11.53	9.85	.84	.13
26	5	2,332	--	3.60	5.75	11.84	--	5.19	34.73	16.60	2.27	1.20	9.01	7.93	.69	.43
27	5	2,686	1.97	5.88	8.19	18.73	--	6.89	17.35	14.18	3.46	2.76	8.67	9.64	.60	1.68
28	2	1,175	--	3.57	6.04	17.45	--	8.34	12.68	7.32	--	1.36	36.09	7.15	--	--
29	1	523	--	4.40	21.03	9.75	--	.57	9.18	21.41	20.65	4.59	8.41	--	--	--
30	2	1,096	1.00	5.38	7.57	16.79	--	2.01	22.99	23.63	6.75	--	4.74	8.30	.82	--
31	1	585	24.79	24.44	5.81	24.10	--	--	2.56	5.81	3.25	1.37	.85	5.81	1.20	--
32	2	1,356	--	1.92	.74	18.29	--	3.69	24.78	25.59	11.73	--	2.21	4.79	4.28	1.99
33	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
34	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
35	1	869	--	--	.58	4.95	--	--	2.30	7.25	2.07	--	15.65	67.20	--	--
Total or average	84	28,246	1.46	6.01	8.53	16.86	.20	5.28	18.42	12.25	2.98	4.66	12.04	9.82	.94	.56

Table 15—Lumber grade recovery as a percentage of surfaced-dry lumber tally volume, log grade 5, mill-length, ponderosa pine logs

Log scaling diameter (Inches)	Number of logs	Total lumber tally (Board feet)	B & Better Select	C Select	D Select	Mould-ing	3 Clear Shop	1 Shop	2 Shop	3 Shop	Shop Out	2 & Better Common	3 Common	4 Common	5 Common	Pitch Select
							Percent of total lumber tally									
6	123	2,389	--	0.25	0.38	0.42	--	--	0.59	--	--	40.77	35.16	17.33	5.11	--
7	80	2,300	0.30	.09	.70	.39	--	--	--	--	--	37.65	40.22	17.30	3.35	--
8	68	2,687	--	.11	1.67	.56	--	--	.19	--	--	42.05	40.49	12.91	2.01	--
9	66	3,233	.25	.59	.74	.68	--	1.14	.37	--	0.46	42.72	40.27	11.51	1.27	--
10	64	4,202	.10	.33	1.93	1.07	--	1.52	.48	0.36	--	39.62	41.10	11.68	1.81	--
11	55	4,558	--	.20	1.29	1.91	--	2.37	1.95	2.04	.22	29.88	42.50	15.75	1.89	--
12	53	4,814	.15	.89	2.01	2.31	--	4.20	4.42	1.77	.35	28.69	41.11	12.57	1.54	--
13	28	3,332	--	.78	.72	1.59	--	6.09	5.22	5.64	1.26	30.34	38.93	8.34	1.08	--
14	44	5,510	--	1.03	1.91	1.58	--	7.64	9.22	4.54	1.03	25.41	39.35	7.44	.82	0.04
15	38	5,691	.19	.93	1.44	2.60	--	5.83	18.06	9.72	.23	19.47	31.73	8.52	1.27	--
16	39	7,145	.56	1.58	4.17	3.83	--	3.81	16.61	13.42	2.18	13.04	32.51	7.00	1.12	.15
17	37	7,322	.05	.55	1.73	5.67	0.23	5.95	27.25	16.72	1.49	13.81	21.57	4.49	.49	--
18	29	6,522	.11	1.33	1.03	2.09	.31	7.77	29.67	17.19	1.27	10.55	19.84	7.88	.97	--
19	28	6,880	.06	2.01	2.51	5.93	.29	10.41	27.18	13.49	.76	11.35	17.81	6.77	1.44	--
20	23	6,416	.03	2.09	2.79	3.29	--	5.28	33.17	17.11	.94	9.09	18.70	6.94	.58	--
21	24	6,611	.32	.83	1.51	3.37	.26	8.59	29.00	21.96	2.65	6.64	16.50	6.25	2.12	--
22	22	7,537	.24	.90	1.11	2.08	.46	9.84	30.34	19.20	3.16	6.97	16.44	8.04	1.21	--
23	16	5,416	--	.37	.70	4.71	--	10.75	34.14	23.26	1.53	6.76	14.12	3.49	.17	--
24	14	5,204	.21	1.81	3.06	9.45	.42	8.92	38.95	13.76	.90	4.53	11.63	4.02	2.34	--
25	15	6,046	.55	1.64	1.75	7.96	.61	10.88	33.99	19.60	3.24	4.57	11.18	2.88	1.16	--
26	8	3,460	--	1.94	1.48	6.56	.58	13.09	36.21	20.58	1.13	1.68	13.90	3.15	--	--
27	6	3,079	.32	1.43	2.92	7.60	--	7.89	30.30	15.82	4.09	.78	13.48	10.75	4.61	--
28	5	2,861	--	1.71	1.96	11.46	--	4.79	29.88	28.66	5.87	2.59	6.12	6.78	.17	--
29	2	719	--	--	--	2.36	--	4.17	35.74	21.84	15.30	1.11	5.15	5.42	8.90	--
30	1	649	--	--	--	1.54	--	9.24	26.66	32.82	8.47	7.40	11.40	2.47	--	--
31	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
32	1	439	--	--	--	6.15	--	--	3.87	23.01	11.16	--	3.87	28.93	23.01	--
Total or average	889	115,022	.16	1.08	1.79	3.90	.16	6.58	21.56	13.10	1.65	15.93	24.57	7.98	1.51	.01

Table 16--Lumber grade recovery as a percentage of surfaced-dry lumber tally volume, mill-length, dead ponderosa pine logs

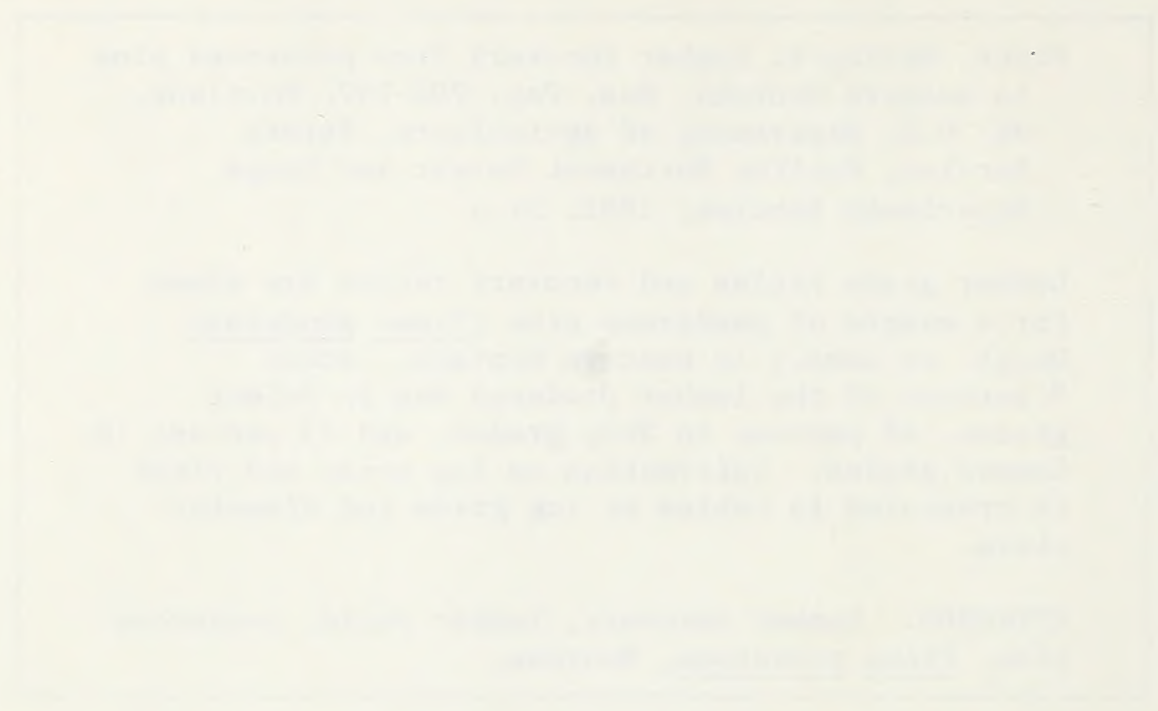| Log scaling diameter	Number of logs	Total lumber tally	B & Better Select	C Select	D Select	Mould-ing	3 Clear	1 Shop	2 Shop	3 Shop	Shop Out	2 & Better Common	3 Common	4 Common	5 Common	Pitch Select
Inches		Board feet						Percent of total lumber tally								
6	5	77	--	--	--	--	--	--	--	--	--	20.78	58.44	20.78	--	--
7	4	121	--	--	--	--	--	--	--	--	--	33.06	57.85	5.79	3.31	--
8	7	257	--	1.17	1.17	1.56	--	--	--	--	--	18.68	48.64	28.79	--	--
9	8	354	--	--	1.41	--	--	--	--	--	--	11.02	59.89	27.68	--	--
10	2	134	--	--	--	--	--	4.48	--	--	--	11.94	52.24	27.61	3.73	--
11	7	598	--	--	--	--	--	--	--	--	--	10.87	48.83	38.63	1.67	--
12	7	558	--	--	--	.54	--	--	--	--	--	16.85	47.79	31.36	3.76	--
13	7	619	--	--	--	.65	--	--	--	--	--	17.93	55.57	22.62	.81	--
14	7	780	--	.26	1.28	3.21	--	1.15	--	1.28	1.03	14.10	26.15	33.08	17.18	--
15	8	1,023	--	--	.49	--	--	--	--	--	--	11.34	55.03	30.60	2.54	--
16	4	543	--	--	2.03	--	--	--	--	--	--	19.52	30.94	38.86	7.18	1.47
17	8	1,470	--	--	.68	.48	--	--	2.31	2.31	--	7.89	36.33	44.29	5.71	1.14
18	3	351	--	--	--	1.14	--	--	--	--	--	12.54	25.07	39.60	20.51	--
19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
20	3	669	--	--	--	--	--	1.20	7.55	--	2.24	8.07	31.09	53.51	2.54	1.35
21	4	1,139	--	.79	--	--	--	.97	--	1.76	--	3.25	22.27	55.05	7.37	--
22	1	209	--	--	3.35	--	--	--	--	--	--	11.00	35.41	27.27	22.97	--
23	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
24	4	1,343	--	--	1.49	2.76	--	2.83	1.12	1.12	.97	3.05	29.64	45.54	10.13	.37
25	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
26	2	718	--	.70	1.95	7.38	--	--	1.39	--	--	6.13	28.97	46.24	7.24	--
27	2	820	--	--	3.17	1.95	--	--	--	--	--	--	45.24	41.71	5.12	2.80
28	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
29	1	566	--	--	2.47	--	--	--	--	--	--	2.47	28.98	40.11	25.97	--
30	1	679	--	.74	1.91	--	--	--	--	--	--	4.12	38.14	47.86	6.63	.59
Total or average	95	13,028	--	.18	1.06	1.17	--	.67	1.19	.61	.28	8.92	37.82	40.24	7.45	.41

Table 17--Lumber grade recovery as a percentage of surfaced-dry lumber tally volume, all log grades combined for live, mill-length ponderosa pine logs

Percent of total lumber tally

Log scaling diameter (Inches)	Number of logs	Total lumber tally (Board feet)	B & Better Select	C Select	D Select	Mould-ing	3 Clear	1 Shop	2 Shop	3 Shop	Shop Out	2 & Better Common	3 Common	4 Common	5 Common	Pitch Select
6	123	2,389	--	0.25	0.38	0.42	--	--	0.59	--	--	40.77	35.16	17.33	5.11	--
7	80	2,300	0.30	.09	.70	.39	--	--	--	--	--	37.65	40.22	17.30	3.35	--
8	68	2,687	--	.11	1.67	.56	--	--	.19	--	--	42.05	40.49	12.91	2.01	--
9	68	3,306	.24	.66	1.12	.88	--	1.12	.30	--	.45	42.04	40.23	11.58	1.30	--
10	66	4,330	.09	.32	2.08	1.50	--	1.48	.46	.35	--	39.77	40.85	11.34	1.76	--
11	57	1,737	.17	.32	1.94	2.00	--	2.28	1.88	1.96	.21	29.15	42.60	15.66	1.82	--
12	56	5,116	.14	1.21	3.44	3.22	--	3.95	4.16	1.66	.33	28.15	40.32	11.96	1.45	--
13	29	3,449	--	.75	.70	1.83	--	5.88	5.33	6.22	1.22	30.15	38.79	8.06	1.04	--
14	49	6,139	.18	2.08	3.50	2.75	--	7.10	8.66	4.59	.93	24.64	36.60	7.35	.85	0.75
15	43	6,485	.32	2.13	2.90	3.72	--	5.58	16.27	8.91	.62	17.89	31.60	7.91	1.46	.69
16	44	8,018	.50	2.63	5.25	5.90	--	3.49	15.91	12.87	2.16	13.02	30.46	6.56	1.06	.14
17	40	7,949	.28	.73	2.98	5.98	0.21	5.99	25.31	15.40	1.37	13.61	21.24	6.23	.58	.10
18	33	7,288	.41	1.88	1.60	5.47	.27	7.62	28.20	15.88	1.25	9.62	19.39	7.37	10.40	--
19	37	9,236	.98	2.97	3.62	8.84	.22	9.58	26.19	13.10	.56	11.87	15.67	5.23	1.07	.11
20	28	7,655	.03	2.46	3.41	6.00	--	5.75	31.10	16.05	.98	9.20	12.02	8.14	.56	--
21	37	10,650	1.24	3.47	5.09	91.60	.16	7.14	15.99	18.24	1.99	6.80	14.06	6.38	1.46	.68
22	33	11,047	.97	3.21	4.40	8.62	.32	8.75	26.28	15.94	2.33	6.38	14.56	7.26	.90	.09
23	30	10,497	1.90	4.74	7.52	13.66	--	6.92	24.61	13.93	1.68	5.90	12.90	4.85	.82	.58
24	21	8,060	1.65	4.27	5.61	12.38	.74	38.37	28.30	13.15	1.77	3.52	11.30	6.22	1.58	1.13
25	28	11,099	1.36	4.00	4.77	12.17	.33	8.39	24.70	16.77	2.48	4.49	10.60	6.24	2.36	1.33
26	21	9,319	3.73	7.56	6.06	15.03	.41	7.32	25.99	14.06	1.21	1.98	9.53	5.69	.73	.66
27	14	7,234	1.84	4.82	7.33	18.01	--	6.74	20.51	12.55	3.03	1.59	10.86	9.36	2.38	.97
28	12	6,872	.81	4.00	4.98	17.81	.29	5.69	20.62	17.18	3.24	1.82	12.67	6.91	.60	3.36
29	5	2,264	4.86	8.97	10.11	10.91	--	6.98	19.88	13.96	9.63	1.90	4.28	3.58	4.95	--
30	3	1,745	.63	3.38	4.76	11.12	--	4.70	24.36	27.05	7.39	2.75	7.22	6.13	.52	--
31	1	585	24.79	24.44	5.84	24.10	--	--	2.56	5.81	3.25	1.37	.85	5.81	1.20	--
32	4	2,450	2.33	5.39	3.39	18.16	--	2.04	16.00	18.29	8.49	--	3.55	10.78	8.53	3.06
33	1	716	22.35	18.44	1.06	17.46	--	7.68	6.00	--	--	--	4.19	7.82	--	--
34	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
35	1	869	--	--	.58	4.95	--	--	2.30	7.25	2.07	--	15.65	67.20	--	--
36	1	735	--	--	1.36	4.62	--	3.54	10.20	4.22	9.93	--	22.86	36.87	6.39	--
Total or average	1,033	165,226	1.21	3.20	4.27	8.69	.16	6.08	19.42	12.08	1.79	12.47	20.37	8.20	1.49	.57

Plank, Marlin E. Lumber recovery from ponderosa pine
in western Montana. Res. Pap. PNW-297. Portland,
OR: U.S. Department of Agriculture, Forest
Service, Pacific Northwest Forest and Range
Experiment Station; 1982. 24 p.

Lumber grade yields and recovery ratios are shown
for a sample of ponderosa pine (Pinus ponderosa
Dougl. ex Laws.) in western Montana. About
9 percent of the lumber produced was in Select
grades, 48 percent in Shop grades, and 43 percent in
Common grades. Information on log scale and yield
is presented in tables by log grade and diameter
class.

KEYWORDS: Lumber recovery, lumber yield, ponderosa
pine, Pinus ponderosa, Montana.